Networking 2006

15 · 19 MAY, COIMBRA, PORTUGAL

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eNEXT

Monday, May 15, 2006 TUTORIALS

08:30 – 09:00 h	Registration			
09:00 – 10:30 h	Tutorial A **BGP: Interdomain Routing and Virtual Private Networks** Olivier Bonaventure – Catholic University of Louvain, BE	Tutorial B **IP-Oriented QoS in the Next Generation Networks: Application to Wireless Networks** Pascal Lorenz – University of Haute Alsace, FR	Tutorial C **Extensible IP Signaling: Architecture, Protocols and Practice** Xiaoming Fu – University of Goettingen, DE Hannes Tschofenig – Siemens, DE	
10:30 – 11:00 h	Coffee break			
11:00 – 12:30 h	Tutorial A	Tutorial B	Tutorial C	
12:30 – 14:00 h	Lunch			
14:00 – 15:30 h	Tutorial A	Tutorial D **Roadmap to Cross-Layer and Cross-System Optimization for B3G** George Kormentzas – University of the Aegean Karlovassi, Greece Charalabos Skianis – NCSR 'D', GR	Tutorial E **Peer-to-Peer Networking** Raouf Boutaba – University of Waterloo, CA	Tutorial F **User directed and QoS driven routing: theoretical and experimental considerations** Erol Gelenbe – University of Central Florida, Orlando, USA
15:30 – 16:00 h	Coffee break			
16:00 – 17:30 h	Tutorial A	Tutorial D	Tutorial E	Tutorial F

Tuesday, May 16, 2006

08:30 – 09:15 h	Registration		
09:15 – 09:30 h	Welcome Address Chairman: Edmundo Monteiro – University of Coimbra, PT		
09:30 – 10:30 h	Keynote Speech **NGN: The Journey and Beyond** Monique Morrow – Cisco Systems, US		
10:30 – 11:00 h	Coffee break		
11:00 – 12:40 h	Mobile Ad-Hoc Networks I	Traffic Engineering I	Monitoring/ Mesurements I
12:40 – 14:00 h	Lunch		
14:00 – 15:40 h	Wireless Networks I	Routing I	Resource Management and QOS
15:40 – 16:10 h	Coffee break		
16:10 – 18:30 h	Topology and Location Awareness	Caching and Content Management	Optical Networks I
17:30 – 18:30 h	Poster Session		
19:00 – 20:00 h	Welcome Reception – City Hall		

Wednesday, May 17, 2006

09:00 – 09:30 h	Registration		
09:30 – 10:30 h	Keynote Speech **Incentives for Large Peer-to-Peer Systems** Costas Courcoubetis – Athens University of Economics and Business, GR		
10:30 – 11:00 h	Coffee break		
11:00 – 12:40 h	Mobile Ad-Hoc Networks II	Transport Protocols	Monitoring/ Mesurements II
12:40 – 14:00 h	Lunch		
14:00 – 15:40 h	Mobility/ Handoff	Peer-to-Peer	Multimedia
15:40 – 16:10 h	Coffee break		
16:10 – 17:25 h	Multicast	Traffic Engineering II	Optical Networks II
19:00 – 23:30 h	Conference Banquet – Figueira da Foz		

Thursday, May 18, 2006

09:00 – 09:30 h	Registration		
09:30 – 10:30 h	Keynote Speech **Network coding – where to now?** Muriel Médard – MIT, US		
10:30 – 11:00 h	Coffee break		
11:00 – 12:40 h	Mobile Ad-Hoc Networks III	Wireless Sensor Networks	Resource Management and QoS II
12:40 – 14:00 h	Lunch		
14:00 – 15:40 h	Wireless Networks II	Routing II	Optical Networks III
15:40 – 16:10 h	Coffee break		
16:10 – 17:10 h	Panel Session		
17:10 – 17:30 h	Closing Remarks		

Friday, May 19, 2006 WORKSHOPS

08:30 – 09:00 h	Registration			
09:00 – 10:30 h	Workshop 1 **Security and Privacy in Mobile and Wireless Netwroking**	Workshop 3 **Performance Control in Wireless Sensor Networks**	Workshop 4 **Towards the QoS Internet**	Workshop 5 **Next Generation Networking Middleware**
10:30 – 11:00 h	Coffee break			
11:00 – 12:30 h	Workshop 1	Workshop 3	Workshop 4	Workshop 5
12:30 – 14:00 h	Lunch			
14:00 – 15:30 h	Workshop 1	Workshop 3	Workshop 4	Workshop 5
15:30 – 16:00 h	Coffee break			
16:00 – 17:30 h	Workshop 1	Workshop 3	Workshop 4	Workshop 5

Networking 2006 is organized by the University of Coimbra, Portugal, and it is the fifth event in a series of International Conferences on Networking sponsored by the IFIP Technical Committee on Communication Systems (TC 6). Previous events were held in Paris (France) in 2000, Pisa (Italy) in 2002, Athens (Greece) in 2004, and Waterloo (Canada) in 2005.

Networking 2006 brings together active and proficient members of the networking community, from both academia and industry, thus contributing to scientific, strategic, and practical advances in the broad and fast-evolving field of communications.

The conference comprises highly technical sessions organized thematically, keynote talks, tutorials offered by experts, as well as workshops and panel discussions on topical themes. Plenary sessions with keynote talks will open the daily sessions, which cover Networking Technologies, Services and Protocols, Performance of Computer and Communication Networks, and Mobile and Wireless Communications Systems.

The Networking 2006 call for papers attracted 440 submissions from 44 different countries in Asia, Australia, Europe, North America, and South America. These were subject to thorough review work by the Program Committee members and additional reviewers. The selection process was finalized in a Technical Program Committee meeting held in Lisbon on January 23rd, 2006.

A high-quality selection of 88 full papers and 31 posters, organized into 24 regular sessions and 1 poster session, makes up the Networking 2006 main technical program, which covers wireless networks, mobile ad-hoc networks, sensor networks, optical networks, peer-to-peer, topology and location awareness, mobility, traffic engineering, routing, transport protocols, monitoring and measurements, resource management, quality of service, multimedia, and caching and content management. The technical program is complemented by three keynote speeches, by Monique Morrow (Cisco Systems, USA), Costas Courcoubetis (Athens University of Economics and Business, Greece) and Muriel Médard (MIT, USA), on next generation networking, peer-to-peer systems, and network coding, respectively.

In addition to the main technical program, the day preceding the conference will be dedicated to six excellent tutorials on BGP - Interdomain Routing and Virtual Private Networks, IP-Oriented QoS in the Next Generation Networks: Application to Wireless Networks, Extensible IP Signaling: Architecture, Protocols and Practice, Roadmap to Cross-Layer and Cross-System Optimization for B3G, Peer-to-Peer Networking, and User directed and QoS driven routing: theoretical and experimental considerations, respectively given by Olivier Bonaventure (Catholic University of Louvain, Belgium), Pascal Lorenz (University of Haute-Alsace, France), Xiaoming Fu and Hannes Tschofenig (University of Goettingen and Siemens, Germany), George Kormentzas and Charalabos Skianis (University of the Aegean Karlovassi and NCSR 'D', Greece), Raouf Boutaba (University of Waterloo, Canada), and Erol Gelenbe (University of Central Florida, Orlando, USA).

The final day of Networking 2006 will be dedicated to four one-day workshops, on the following topics: Security and Privacy in Mobile and Wireless Networking, Performance Control in Wireless Sensor Networks, Towards the QoS Internet, and Next Generation Networking Middleware.

We wish to record our appreciation of the efforts of many people in bringing about the Networking 2006 conference: to all the authors that submitted their papers to the conference, regretting that it was not possible to accept more papers; to the Program Committee and to all associated reviewers; to our sponsors and supporting institutions. Finally, we would like to thank all the people that helped us at the University of Coimbra, namely Márcia Espírito Santo, Paula Mano, and all the volunteers from the Laboratory of Communications and Telematics.

May 2006,
Fernando Boavida
Thomas Plagemann
Burkhard Stiller
Cedric Westphal
Edmundo Monteiro

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Monday, May 15th, 2006 – Tutorials

8:30 h Registration

9:00 h Tutorials A, B and C (parallel sessions)

Tutorial A – **BGP: Interdomain Routing and Virtual Private Networks**
Olivier Bonaventure – Catholic University of Louvain, Belgium

Tutorial B – **IP-Oriented QoS in the Next Generation Networks: Application to Wireless Networks**
Pascal Lorenz – University of Haute-Alsace, France

Tutorial C – **Extensible IP Signaling: Architecture, Protocols and Practice**
Xiaoming Fu – University of Goettingen, Germany
Hannes Tschofenig – Siemens, Germany

10:30 h Coffee break

11:30 h Tutorials A, B and C (parallel sessions)

Tutorial A – **BGP: Interdomain Routing and Virtual Private Networks**
Olivier Bonaventure – Catholic University of Louvain, Belgium

Tutorial B – **IP-Oriented QoS in the Next Generation Networks: Application to Wireless Networks**
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Tutorial C – **Extensible IP Signaling: Architecture, Protocols and Practice**
Xiaoming Fu – University of Goettingen, Germany
Hannes Tschofenig – Siemens, Germany

12:30 h Lunch

14:00 h Tutorials A, D, E and F (parallel sessions)

Tutorial A – **BGP: Interdomain Routing and Virtual Private Networks**
Olivier Bonaventure – Catholic University of Louvain, Belgium

Tutorial D – **Roadmap to Cross-Layer and Cross-System Optimization for B3G**
George Kormentzas – University of the Aegean Karlovassi, Greece
Charalabos Skianis – NCSR 'D', Greece

Tutorial E – **Peer-to-Peer Networking**
Raouf Boutaba – University of Waterloo, Canada

Tutorial F – **User directed and QoS driven routing: theoretical and experimental considerations**
Erol Gelenbe – University of Central Florida, Orlando, USA

15:30 h Coffee break

16:00 h Tutorials A, D, E and F (parallel sessions)

Tutorial A – **BGP: Interdomain Routing and Virtual Private Networks**
Olivier Bonaventure – Catholic University of Louvain, Belgium

Tutorial D – **Roadmap to Cross-Layer and Cross-System Optimization for B3G**
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Erol Gelenbe – University of Central Florida, Orlando, USA

Tuesday, May 16th, 2006 – Technical Sessions

8:30 h Registration

9:15 h Opening and Keynote Talk – Auditorium
Welcome Addresss
Edmundo Monteiro – University of Coimbra, Portugal

Keynote Speech: **NGN: The Journey and Beyond**
Monique Morrow – Cisco Systems, USA

10:30 h Coffee break

Parallel sessions

11:00 h **Mobile Ad-Hoc Networks I** – Auditorium
Session Chair: **Jun-Hong Cui** – University of Connecticut, USA

A Scheme to Provide Proportionally Differentiated End-to-end Packet Delay in Wireless **Multi-Hop Ad Hoc Networks**
Peng-Yong Kong – Institute for Infocomm Research, Singapore
Dan Li – National University of Singapore, Singapore

Service Differentiation via Adaptive Gateway Discovery in Ad Hoc Networks Connected to Wired Networks
Mari Carmen Domingo – Catalonia University of Technology (UPC) , Spain

Stability-Throughput Tradeoff and Routing in Multi-Hop Wireless Ad-Hoc Networks
Rachid ElAzouzi – LIA, Université d'Avignon, France
Eitan Altman – INRIA, France

Kherani Arzad Alam – Indian Institute of Technology, India

EASR: An Energy Aware Source Routing with Disjoint Multipath Selection for Energy-efficient Multihop Wireless Ad hoc Networks
Do-Youn Hwang, **Jae-Sung Lim**, **Eui-Hyeok Kwon** – Ajou University, Republic of Korea

11:00 h **Traffic Engineering I** – Room 9
Session Chair: **Olivier Bonaventure** – Catholic University of Louvain, BE

On Improving the Accuracy of OSPF Traffic Engineering
Gábor Rétvári, **József J. Biró**, **Tibor Cinkler** – Budapest University of Technology and Economics, Hungary

Achieving Bursty Traffic Guarantees by Integrating Traffic Engineering and Buffer Management Tools

Miriam Allalouf, **Yuval Shavitt** – Tel Aviv University, Israel

How Well Do Traffic Engineering Objective Functions Meet TE Requirements
Simon Balon, **Fabian Skivée**, **Guy Leduc** – University of Liège, Belgium

Variable Step Fluid Simulation for Communication Network
Hongjoong Kim – Korea University , Republic of Korea
Junsoo Lee – Sookmyung Women's, Republic of Korea

11:00 h **Monitoring/Measurements I** – Room 10
Session Chair: **Philippe Owezarski** – LAAS-CNRS, FR

Estimation Link Capacity in High Speed Networks
Ling-Jyh Chen – Institute of Information Science, Academia Sinica, Taiwan
Tony Sun, **Li Lao**, **Guang Yang**, **M. Y. Sanadidi**, **Mario Gerla** – Department of Computer Science, UCLA, USA

Internet Traffic Mid-Term Forecasting: a Pragmatic Approach using Statistical Analysis Tools
Babiarz Rachel, **Jean-Sebastien Bedo** – France Telecom R&D Division, France

Semantic Compression of TCP Traces
Gabriel Istrate, **Anders Hansson**, **Sunil Thulasidasan** – Los Alamos National Laboratory, USA
Madhav Marathe, **Chris Barrett** – Virginia Bioinformatics Institute, USA

Traffic Anomaly Detection and Characterization in the Tunisian National University Network
Ramah Houerbi Khadija, **Ayari Hichem**, **Kamoun Farouk** – École Nationale des Sciences de l'Informatique, Tunisia

12:40 h Lunch

Parallel sessions

14:00 h **Wireless Networks I** – Auditorium
Session Chair: **Kimon Kontovasilis** – NCSR Demokritos, GR

B-EDCA: A New IEEE 802.11e-based QoS Protocol for Multimedia Wireless Communications
José Villalón, Pedro Cuenca, Luis Ororco-Barbosa – UCLM, Spain
A Lagrangian Approach for the Optimal Placement of Wireless Relay Nodes in Wireless Local Area Networks
Aaron So, Ben Liang – University of Toronto, Canada

Correlated Equilibrium in Access Control for Wireless Communications
Eitan Altman – INRIA Sophia Antipolis, France
Merouane Debbah – Institut Eurecom, France
Nicolas Bonneau – INRIA Sophia Antipolis, France

Design and Analysis of an Adaptive Backoff Algorithm for IEEE 802.11 DCF mechanism
Mouhamad Ibrahim, Sara Alouf – INRIA, France

14:00 h **Routing I** – Room 9
Session Chair: **Guy Leduc** – University of Liege, BE

A comparison of exact and e-approximation algorithms for constrained routing
Fernando Kuipers, Piet Van Mieghem – Delft University of Technology, Netherlands
Danny Raz , Ariel Orda – Technion, Israel

Path Selection Techniques to Establish Constrained Interdomain MPLS LSPs
Cristel Pelsser, Olivier Bonaventure – Université Catholique de Louvain, Belgium

Reliable Routings in Networks with Generalized Link Failure Events
Stamatis Stefanakos – University of Rome "La Sapienza", Italy

Making Outbound Route Selection Robust to Egress Point Failure
Mina Amin, Kin-Hon Ho, Michael Howarth, George Pavlou – Centre for Communication Systems Research, United Kingdom

14:00 h **Resource Management and QoS I** – Room 10
Session Chair: **David Hutchison** – Lancaster University, UK

An Approach to Off-line Inter-domain QoS-Aware Resource Optimization
Manuel Pedro, Edmundo Monteiro, Fernando Boavida – University of Coimbra, Portugal

A Distributed QoS Scheduler for Smoothing Output Traffic of Input Buffered Switches
Man-Ting Choy, Tony T. Lee – The Chinese University of Hong Kong

VoD QAM Resource Allocation Algorithms
Jim Martin – Clemson University, USA
Jiong Gong, David Reed, Terry Shaw, Daniel Vivanco – CableLabs, USA

Performance of Experience-Based Admission Control in the Presence of Traffic Changes
Jens Milbrandt, Michael Menth, Jan Junker – University of Würzburg, Germany

15:40 h Coffee break

Parallel sessions

16:10 h **Topology and Location Awareness –** Auditorium
Session Chair: **Thomas Plagemann** – University Oslo, NO

Topologically-Aware AAA Overlay Network in Mobile IPv6 Environment
Jun Li, **Ye Tian** – Institute of Computing Technology, Chinese Academy of Sciences , China
Xin-ming Ye – Inner Mongolia University, China

QoS-Aware Multi-tier Location Managements for Integrated WLAN/UMTS Networks
Yun Won Chung – Soongsil University, Republic of Korea

Leveraging Buffering Delay Estimation for Geolocation of Internet Hosts
Gueye Bamba, **Serge Fdida** – Université Pierre et Marie Curie (LIP6), France
Steve Uhlig – Université Catholique de Louvain, Department of Computing Science and Engineering
Artur Ziviani – National Laboratory for Scientific Computing (LNCC)

16:10 h **Caching and Content Management –** Room 9
Session Chair: **Vera Goebel** – University Oslo, NO

A Feedback Control Approach to Mitigating Mistreatment in Distributed Caching Groups
Georgios Smaragdakis, **Ibrahim Matta**, **Azer Bestavros** – Boston University, USA
Nikolaos Laoutaris – Boston University, USA andDept of Informatics and Telecommunications, University of Athens, Athens, Greece
Ioannis Stavrakakis – Dept of Informatics and Telecommunications, University of Athens, Athens, Greece

Locality of Reference in an Hierarchy of Web Caches
Fernando Duarte Oliveira Castro, **Fabrício Benevenuto**, **Virgílio Almeida**, **Jussara Almeida** – Federal University of Minas Gerais, Brazil

DMTP: Controlling Spam Through Message Delivery Differentiation
Zhenhai Duan – Florida State University, USA
Yingfei Dong – Univ. of Hawaii, USA
Kartik Gopalan – Florida State University, USA

16:10 h **Optical Networks I –** Room 10
Session Chair:**Xavier Masip** – Univ. Polit. Catalunya, ES

Delay Performance Analyses for an Agile All-Photonic Star Network
Cheng Peng, **Peng He**, **Gregor v. Bochmann**, **Trevor J. Hall** – University of Ottawa, Canada

Designing Scalable WDM Optical Interconnects Using Predefined Wavelength Conversion
Haitham Hamza, **Jitender Deogun** – University of Nebraska-Lincoln, USA

Designing Fast and Bandwidth Efficient Protection Scheme for WDM Optical Networks
Yu Lin, Jitender Deogun, Haitham Hamza – University of Nebraska-Lincoln, USA

17:30 h **PosterSession** – Auditorium Lounge

An Adaptive Parameter Deflection Routing to Resolve Contentions in OBS Networks
Keping Long, Xiaolong Yang – Research Centre for Optical Internet and Mobile Information Networks (COIMIN)
Sheng Huang, Qianbin Chen, Ruyan Wang – Chongqing Univ. of Posts and Telecomm – China

Bandwidth Utilization in Sorted-Priority Schedulers
Tae-Joon Kim – Kongju National University , Republic of Korea

A Multicast Approach for UMTS: A Performance Study
Antonios Alexiou, Dimitrios Antonellis, Christos Bouras – Univ. of Patras and RACTI, Greece, Gibraltar

Echidna: Efficient Clustering of Hierarchical Data for Network Traffic Analysis
Abdun Naser Mahmood, Udaya Parampalli, Christopher Leckie – Department of Computer Science and Software Engineering, Australia

Cross-Layer Performance of a Distributed Real-Time MAC Protocol Supporting Variable Bit Rate Multiclass Services in WPANs
David Tung Chong Wong – Institute for Infocomm Research, A*STAR, Singapore
Jon W. Mark – University of Waterloo, Canada
Kee Chaing Chua – National University of Singapore, Singapore

Performance Analysis of Random Access Protocol in IEEE802.16e
Sang-Sik Ahn, Hyong-Woo Lee - Department of Electronics and Information Engineering - Korea University
Jun Bae Seo – Electronics and Telecommunications Research Institute, Republic of Korea
Choong-Ho Cho – Department of Computer Science - Korea University,

Cost-Benefit Analysis of Web Prefetching Algorithms from the User's Point of View
Josep Domènech, Ana Pont, José A. Gil, Julio Sahuquillo – Universitat Politècnica de València, Spain

An MPLS-Based Micro-Mobility Solution – IEEE-802.21-Based Control Plane **Rajendra Persaud, Ralf Wienzek** – RWTH Aachen, Germany
Gerald Bergho, Ralf Schanko – Nokia Networks GmbH, Germany

A Comparative Performance Study of IPv6 Transitioning Mechanisms - NAT-PT vs. TRT vs. DSTM
Michael Mackay, Christopher Edwards – Computing Department, InfoLab 21, United Kingdom

CAC: Context Adaptive Clustering for Efficient Data Aggregation in Wireless Sensor Networks
Guang-yao Jin, Myong-Soon Park – Korea University, Republic of Korea

On the Performance of Cooperative Diversity in Infrastructure-Based Networks with Two Relays
Jun Yeop Jung – Yonsei University, Republic of Korea

IP Mobility Support with a Multihomed Mobile Router
Hee-Dong Park – Pohang College, Republic of Korea
Dong-Won Kum, **Yong-Ha Kwon**, **Kang-Won Lee**, **You-Ze Cho** – School of Electrical Engineering & Computer Science, Kyungpook National University, Daegu, Korea

Performance Analysis and Design: Power Saving Backoff Algorithm for IEEE 802.11 DCF
Feng Zheng, **John Nelson**, **Barry Gleeson** – University of Limerick, Ireland

A Fast Pattern-Matching Algorithm for Network Intrusion Detection System
Jung-Sik Sung – ETRI, Republic of Korea
Taeck-Geun Kwon, **Seok-Min Kang** – Chungnam National University, Republic of Korea

Multicast OLSP Establishment Scheme in OVPN over IP/GMPLS over DWDM
Jeong-Mi Kim – Pukyong National University, Republic of Korea
Jae-Il Jung – Hanyang University, Republic of Korea
Oh-Han Kang – Andong National University, Republic of Korea
Sung-Un Kim – Pukyong National University, Republic of Korea

Directional Reception vs. Directional Transmission for Maximum Lifetime Multicast Delivery in Ad-Hoc Networks
Kerry Wood, Luiz A. DaSilva – Virginia Tech, USA

Micro- and macroscopic analysis of RTT variability in GPRS and UMTS networks
Jorma Kilpi – VTT Information Technology, Finland
Pasi Lassila – Helsinki University of Technology, Finland

Control plane protection using Link Management Protocol (LMP) in the ASON/GMPLS CARISMA network
Jordi Perelló, **Eduard Escalona**, **Salvatore Spadaro**, **Fernando Agraz**, **Jaume Comellas**, **Gabriel Junyent** – Universitat Politecnica de Catalunya, Spain

A Novel Resource Allocation Scheme for Reducing MAP Overhead and Maximizing Throughput in MIMO-OFDM Systems
Chung Ha Koh, **Kyung Ho Sohn**, **Ji Wan Song**, **Young Yong Kim** – Yonsei University, Republic of Korea

Secure Distance Vector Routing Protocol using Factual Correctness
Muthuprasanna Muthusrinivasan, **Manimaran Govindarasu** – Iowa State University, USA

Entropy based flow aggregation
Yan Hu, **Dah-Ming Chiu**, **John C. S. Lui** – The Chinese University of Hong Kong

Monitoring Wireless Sensor Networks Using a Model-aided Approach
Chongqing Zhang, **Minglu Li**, **Min-You Wu** and **Wenzhe Zhang** – Shanghai Jiaotong University, China

VBF: Vector-Based Forwarding Protocol for Underwater Sensor Networks
Peng Xie, **Jun-Hong Cui**, University of Connecticut, USA
Li Lao, University of California, Los Angeles, USA

Hybrid ARQ Scheme with Antenna Permutation for MIMO Systems in Slow Fading Channels
Jianfeng Wang, **Meizhen Tu**, **Kan Zheng**, **Wenbo Wang** – Beijing University of Posts and Telecommunications, China

Scalable Quantitative Delay Guarantee Support in DiffServ Networks Through NSIS
Jian Zhang, **Maxweel Carmo**, **Marilia Curado**, **Jorge Sa Silva**, **Fernando Boavida** – University of Coimbra, PT

SDC: A Distributed Clustering Protocol for Peer-to-Peer Networks
Yan Li, University of Connecticut, USA
Li Lao, University of California, Los Angeles, USA
Jun-Hong Cui, University of Connecticut, USA

A New Burst Scheduling Algorithm for Edge/Core Node Combined Optical Burst Switched Networks
SeoungYoung Lee, **InYong Hwang**, and **HongShik Park** – Optical Internet Research Center, Republic of Korea

Distributed Real-time Monitoring with Accuracy Objectives
Alberto Gonzalez Prieto, **Rolf Stadler** – KTH Royal Institute of Technology, Sweden

Improving Load Balance of Ethernet Carrier Networks using IEEE 802.1S MSTP with Multiple Regions
Amaro de Sousa, **Gil Soares** – Institute of Telecommunications / University of Aveiro, Portugal

A Simple Sink Mobility Support Algorithm for Routing
Chun-Su Park, **You-Sun Kim**, **Kwang-Wook Lee**, **Seung-Kyun Kim**, **Sung-Jea Ko** – Korea University, Republic of Korea

Concurrent Diagnosis of Clustered Sensor Networks
Chin-Woo Cho, **Yoon-Hwa Choi** – Hongik University, Republic of Korea

19:00 h **Welcome Reception** – City Hall

Wednesday, May 17th, 2006

9:00 h Registration

9:30 h Keynote Speech: **Incentives for Large Peer-to-peer Systems**
Costas Courcoubetis – Athens University of Economics and Business, Greece

10:30 h Coffee break

Parallel sessions

11:00 h **Mobile Ad-Hoc Networks II** – Auditorium
Session Chair: **Tereza Vazão** – University Técnica de Lisboa, PT

Increasing Fairness and Efficiency using the MadMac Protocol in Ad Hoc Networks
Tahiry Razafindralambo, **Isabelle Guerin-Lassous** – INRIA, France

Duplicate Address Detection in Wireless Ad Hoc Networks Using Wireless Nature
Yu Chen, **Eric Fleury** – ARES/INRIA -- INSA de Lyon, France

Fault Monitoring in Ad-Hoc Networks based on Information Theory
Remi Badonnel, **Radu State**, **Olivier Festor** – LORIA-INRIA Lorraine, France

Performance Analysis of Exposed Terminal Effect in IEEE 802.11 Ad Hoc Networks in Finite Load Conditions
Dimitris Vassis, **Georgios Kormentzas** – University of the Aegean , Greece

11:00 h **Transport Protocols** – Room 9
Session Chair: **Michel Diaz** – LAAS-CNRS, FR

Modeling and Performance Evaluation of SCTP as Transport Protocol for Firewall Control

Sebastian Kiesel, **Michael Scharf** – University of Stuttgart, Institute of Communication Networks and Computer Engineering, Germany

Transport Layer Issues in Delay Tolerant Mobile Networks
Khaled Harras, **Kevin Almeroth** – University of California, Santa Barbara (UCSB), USA

Performance of Competing High-Speed TCP Flows
Michele Weigle, **Jesse Freeman**, **Pankaj Sharma** – Clemson University, USA

On the accuracy of analytical models of TCP throughput
El Khayat Ibtissam, **Pierre Geurts**, **Guy Leduc** – University of Liège, Belgium

11:00 h **Monitoring/Measurements II** – Room 10
Session Chair: **Gunter Haring** – University of Wien, AT

High Speed Packet Logging on a Budget
Chad Mano, **Aaron Striegel**, **Bill Bordogna**, **Jeff Smith** – University of Notre Dame, USA

An Efficient Overlay Link Performance Monitoring Technique
Zhi Li – Network Systems Engineering, AT&T, USA
Prasant Mohapatra – Department of Computer Science, USA
Lihua Yuan – Department of Electrical and Computer Engineering, USA

Measurement of Radio Propagation Path Loss over the Sea for Wireless Multimedia
Dong You Choi – Chosun University, Republic of Korea

Workload Loss Examinations with a Novel Probabilistic Extension of Network Calculus
József Bíró, **András Gulyás** – Budapest University of Technology and Economics, Hungary

12:40 h Lunch

Parallel sessions

14:00 h **Mobility/Handoff** – Auditorium
Session Chair: **Georgios Kormentzas** – University of the Aegean Karlovassi, GR

Optimized Handoff Decision Mechanisms for Scalable Network Mobility Support
Sangwook Kang, **Yunkuk Kim**, **Woojin Park**, **Jaejoon Jo**, **Sunshin An** – Korea University, Republic of Korea

Fast Re-Authentication for Handovers in Wireless Communication Networks
Ralf Wienzek, **Rajendra Persaud** – RWTH Aachen University, Germany

Handover Operation in Mobile IP-over-MPLS Networks
Vasos Vassiliou – University of Cyprus, Cyprus

The design and implementation of a quality-based handover trigger
Ian Marsh – SICS, Sweden
Florian Hammer – FTW, Austria
Bjorn Gronvall – SICS, Sweden

14:00 h **Peer-to-Per** – Room 9
Session Chair: **Laurent Mathy** – Lancaster University, UK

An Efficient Algorithm for Resource Sharing in Peer-to-Peer Networks
Wei-Cherng Liao, **Fragkiskos Papadopoulos**, **Konstantinos Psounis** – University of Southern California, USA

On The Identification and Analysis of P2P Traffic Aggregation
Trang Dinh Dang, **Marcell Perényi**, **András Gefferth**, **Sándor Molnár** – Budapest University of Technology & Economics, Hungary

A Decentralized Recommendation System based on Self-Organizing Partnerships
Giancarlo Ruffo, **Rossano Schifanella**, **Enrico Ghiringhello** – Università di Torino, Italy

Enhancing the P2P protocols to support advanced multi-keyword queries
Samir Ghamri-Doudane – LIP6, France
Nazim Agoulmine - LRSM, University of Evry, France

14:00 h **Multimedia** – Room 10
Session Chair: **Alexandre Santos** – University of Minho, PT

Chasing: An Efficient Streaming Mechanism for Scalable and Resilient Video-on-Demand Service over Peer-to-Peer Networks
Jian-Guang Luo, **Yun Tang**, **Shi-Qiang Yang** – Tsinghua University, P.R.China

A practical Approach to SIP, QoS and AAA Integration
Michael Stier, **Emanuel Eick**, **Eckhard Koerner** – University of Applied Sciences Mannheim, Germany
Efficient Overlay Audio Conferencing
Norbert Egi, **Laurent Mathy**, **Nick Blundell** – Lancaster University, United Kingdom

On the Stability of End-point-based Multimedia Streaming
György Dan, **Gunnar Karlsson**, **Viktoria Fodor** – KTH/S3/LCN, Sweden

15:40 h Coffee break

Parallel sessions

16:10 h **Multicast** – Auditorium
Session Chair: **Manuel Ricardo** – INESC-N, PT

Multicast Tree Aggregation in Large Domains
Joanna Moulierac – IRISA-INRIA Rennes, France
Alexandre Guitton – Birckbeck College, United Kingdom
Miklos Molnar – INSA Rennes, France

Analysis and Performance Evaluation of a Multicast File Transfer Solution for Congested Asymmetric Networks
Pilar Manzanares-Lopez, **Juan Carlos Sanchez-Aarnoutse**, **Joan Garcia-Haro**, **Josemaria Malgosa-Sanahuja** – Technical University of Cartagena, Spain

16:10 h **Traffic Engineering II** – Room 9
Session Chair: **Susana Sargento** – University of Aveiro, PT

Multi-Layer Traffic Engineering through Adaptive Lambda-Path Fragmentation and De-Fragmentation: The *Grooming-Graph* and the *Shadow-Capacities*
Tibor Cinkler, **Péter Hegyi**, **Márk Asztalos**, **Géza Geleji**, **János Szigeti**, **András Kern** – Budapest University of Technology and Economics, Hungary

Managing Traffic Demand Uncertainty in Replica Server Placement with Robust Optimization
Kin-Hon Ho, **Stylianos Georgoulas**, **Mina Amin**, **George Pavlou** – Centre for Communication Systems Research, United Kingdom

An Information Theoretic Approach for Systems with Parallel Distributions: Case Studying Internet Traffic
Charalabos Skianis, **Lambros Sarakis** – National Centre for Scientific Research 'Demokritos', Greece

16:10 h **Optical Networks II** – Room 10
Paulo Pinto – University Nova de Lisboa, PT

Characterization of the Burst Aggregation Process in Optical Burst Switching
Xenia Mountrouidou, **Harry G. Perros** – North Carolina State University, USA

Improving Bandwidth Efficiency in a Multi-Service Slotted Dual Bus Optical Ring Network
Mohamad Chaitou, **Hind Castel**, **Gérard Hébuterne** – INT, France

Issues on Performance Assessment of Optical Burst Switched Networks: Burst Loss Versus Packet Loss Metrics
Nuno M. Garcia – University of Beira Interior, Portugal and Siemens SA, Information and Communication, RD1, Research
Przemyslaw Lenkiewicz
Paulo P. Monteiro – Siemens SA, Information and Communication, RD1, Research
Mário Freire – University of Beira Interior, Portugal

19:00 h Conference Banquet – Figueira da Foz

Thursday, May 18th, 2006

9:00 h Registration

9:30 h Keynote Speech: **Network coding - where to now?**
Muriel Médard – MIT, USA

10.30 h Coffee break

Parallel sessions

11:00 h **Mobile Ad-Hoc Networks III** – Auditorium
Session Chair: **Jorge Sá Silva** – University of Coimbra, PT

A Multi-hop MAC Forwarding Protocol for Inter-Vehicular Communication
Woosin Lee, **Hyukjoon Lee** – Kwangwoon University, Republic of Korea
Hyun Lee, **ChangSub Shin** – Electronics and Telecommunications Research Institute, Republic of Korea

Route Lifetime based Optimal Hop Selection in VANETs on Highway: An Analytical Viewpoint
Dinesh Kumar, **Altman Eitan**, **Kherani Arzad A.** – INRIA, France

Performance Evaluation of the Routing Protocols in MANET: Classical versus Self-Organized Approaches
Fabrice Theoleyre, **Fabrice Valois** – CITI Laboratory, INRIA ARES, INSA Lyon, France

Performance Modeling of Epidemic Routing
Xiaolan Zhang – University of Massachusetts, USA
Giovanni Neglia – Universite' degli Studi di Palermo, Italy
Jim Kurose, Don Towsley – University of Massachusetts, USA

11:00 h **Wireless Sensor Networks** – Room 9
Session Chair: **Ramon Puigjaner** – University de Illes Balears, ES

Maximum Lifetime Routing and Data Aggregation for Wireless Sensor Networks
Cunqing Hua, Tak-Shing Peter Yum – The Chinese University of Hong Kong

Managing Random Sensor Networks by means of Grid Emulation
Alfredo Navarra – University of L'Aquila, Italy
Zvi Lotker – Centrum voor Wiskunde en Informatica, Netherlands

Distributed Data Gathering in Multi-Sink Sensor Networks with Correlated Sources
Kevin Yuen, Baochun Li, Ben Liang – University of Toronto, Canada

Abstract Frames for Reducing Overhearing in Wireless Sensor Networks
Abdelmalik Bachir – France Telecom and LSR-IMAG Laboratory, France
Dominique Barthel – France Telecom, France
Martin Heusse, Andrzej Duda – LSR-IMAG Laboratory, France

11:00 h **Resource Management and QoS II** – Room 10
Session Chair: Aaron Striegel – University of Notre Dame, USA

Dynamic Resource Allocation in Communication Networks
Antonio Capone – Politecnico di Milano, Italy
Jocelyne Elias – Laboratoire d'Informatique de Paris 6 (LIP6), France
Fabio Martignon – University of Bergamo, Italy
Guy Pujolle – University Pierre et Marie Curie, France

Fair Assured Services without Any Special Support at the Core
Sergio Herrería-Alonso, Manuel Fernández-Veiga, Cándido López-García, Andrés Suárez-González, Miguel Rodríguez-Pérez – Universidade de Vigo, Spain

Max-min fair distribution of modular network flows on fixed paths
Pål Nilsson, Michal Pióro – Lund University, Sweden

Anticipatory Distributed Packet Filter Configuration for Carrier-grade IP-Networks
Birger Toedtmann, Erwin Rathgeb – University Duisburg-Essen, Germany

12:40 h Lunch

Parallel sessions

14:00 h **Wireless Networks II** – Auditorium
Session Chair: Charalabos Skianis – NCSR 'D', GR

Fast Handoff Scheme for Seamless Multimedia Service in Wireless LAN
Hye-Soo Kim, Sang-Hee Park, Chun-Su Park, Jae-Won Kim, Sung-Jea Ko – Korea University, Republic of Korea

On the Tradeoff Between Blocking and Dropping Probabilities in CDMA Networks Supporting Elastic Services
Gabor Fodor – Ericsson Research, Sweden
Miklós Telek – Budapest University of Technology and Economics, Hungary
Leonardo Badia – Consorzio Ferrara Ricerche, Italy

A Point-to-Point Protocol Improvement to reduce Data Call Setup Latency in Cdma2000 system
Eun-sook Lee, **Kyu-seob Cho** – SungKyunKwan University , Republic of Korea
Sung Kim – SK Telecom Co., Republic of Korea

Performance and Analysis of CDM-FH-OFDMA for Broadband Wireless Systems
Kan Zheng, **Lu Han**, **Jianfeng Wang**, **Wenbo Wang** – Beijing University of Posts & Telecommunications, China

14:00 h **Routing II** – Room 9
Session Chair: **Rui Aguiar** – University of Aveiro, PT

Multi-Service Routing: a Routing Proposal for the Next Generation Internet
António Varela, Teresa Vazão, Guilherme Arroz – Instituto Superior Técnico, Portugal

Quantifying the impact of route-reflection on BGP routes diversity inside a tier-1 network
Steve Uhlig, **Sébastien Tandel** – Université Catholique de Louvain, Belgium

Distributed QoS Routing for Backbone Overlay Networks
Li Lao, University of California, Los Angeles, USA
Swapna Gokhale, **Jun-Hong Cui**, University of Connecticut, USA

Distributed Linear Time Construction of Colored Trees for Disjoint Multipath Routing
Srinivasan Ramasubramanian, **Marwan Krunz**, **Mithun Harkara** – University of Arizona, USA

14:00 h **Optical Networks III** – Room 10
Session Chair: **Mario Freire** – University of Beira Interior, PT

Cross-Virtual Concatenation for Ethernet-over-SONET/SDH Networks
Satyajeet S Ahuja, **Marwan Krunz** – University of Arizona, Tucson, USA

Optimal Wavelength Converter Placement with Guaranteed Wavelength Usage
Can Fang – ICIS, EEE, NTU, Singapore
Chor ping Low - ICIS, School of EEE, Nanyang Technological University, Singapore

Estimating network offered load for OBS networks
Marek Hajduczenia – Siemens S.A COM RD1 RS, Portugal and Universidade de Coimbra, Portugal
Henrique J. A. da Silva – Universidade de Coimbra, Portugal
Paulo P. Monteiro, **Przemyslaw Lenkiewicz** – Siemens S.A COM RD1 RS, Portugal and Instituto de Telecomunicações – Pólo de Aveiro, Universidade de Aveiro, Portugal
Mário M. Freire - Department of Informatics, University of Beira Interior

15:40 h Coffee break

16:10 h Panel session
Trends and Research Issues in Broadband Access
Session Chair: **André Danthine**, Université de Liège, BE

17:10 h Closing remarks

8:30 h Friday, May 19th, 2006 – Workshops

Registration

Workshops – parallel sessions

9:00 h Workshop 1 – **SecPri_MobiWi 2006**
(1st International Workshop on SECURITY AND PRIVACY IN MOBILE AND WIRELESS NETWORKING)
Organizers: **Stefanos Gritzalis**, **Angelos Rouskas**, **Charalabos Skianis**, **University of the Aegean**, **Greece**

Welcome

Location-based Metadata and Negotiation Protocols for LBAC in a One-to-Many Scenario
Claudio Agostino Ardagna, Marco Cremonini, Ernesto Damiani, Sabrina De Capitani di Vimercati and Pierangela Samarati

An Overview of Open Issues and Preliminary Solutions Regarding Security in Ad-hoc Networks
Rafael Timóteo de Sousa Jr., Robson de Oliveira Albuquerque, Fabio Mesquita, Buiati and Luis Javier Garcia Villalba

9:00 h Workshop 3 – **3rd International *Workshop on Performance Control in Wireless Sensor Networks***
Organizers: **Hartmut Ritter** – Freie Universitaet Berlin, **Utz Roedig** – University College Cork

Welcome

Sensor Network Calculus with Multiple Sinks
J. B. Schmitt, F. A. Zdarsky, U. Roedig

QoS Routing in 2-Hop Wireless Networks
I. Oh, H. Lee, J. Choi

9:00 h Workshop 4 – **2006 International Workshop *Towards the QoS Internet* – To-QoS'2006**
Organizer: **Wojciech Burakowski** – Warsaw University of Technology, Poland

Opening: Wojciech Burakowski

Session 1: **IST Projects**
Session Chair: Jose Enriquez Gabeiras

Hybrid on-path off-path approach for end-to-end signalling across NSIS and non-NSIS domains (HyPath)
Luis Cordeiro, Marilia Curado, Edmundo Monteiro, Florin Racaru, Michel Diaz, Christophe Chassot

NETQOS: Policy Based Management of Heterogeneous Networks for Guaranteed QoS
Stefano Avallone, Pasquale Di Gennaro, Ilka Miloucheva, Sathya Rao, and Markus Roth

Inter-network Quality of Service Agreements among Ambient Networks
Jorge Andres-Colas, Carlos Pinho, Paulo Mendes, Yaning Wang, Jose Ruela
Open Interconnect for the Internet Community (OpenNet)
Martin Potts, Edmundo Monteiro, Donal Morris, Michel Diaz, Monique Morrow, Jean-Marc Uze

The AGAVE Framework for QoS: Extending DiffServ by means of Differentiated Routing
Antonio J. Elizondo, María L. Garcia-Osma, Jorge Rodriguez Sanchez

9:00 h Workshop 5 – 3rd International Workshop on *Next Generation Networking Middleware* – NGNM06
Organizer: **George Kormentzas** – University of Aegean, GR

Welcome – Workshop Goals
G. Kormentzas

Towards a generic NGN/IMS client system for flexible NGN service provision
Y. Huang, T. Magedanz

Developing IPv6 movement detection and localised service
discovery mechanisms for a message-based framework
B. Silverajan, J. Harju

10:30 h Coffee break

Workshops – parallel sessions

11:00 h Workshop 1 – SecPri_MobiWi 2006

An Intrusion Detection System for Mobile Ad-Hoc Networks
Ningrinla Marchang and Raja Datta

WiMAX Security Architecture
Rainer Falk, Christian Guenther, Dirk Kroeselberg and Avi Lior

A Secure and Efficient Key Recovery Scheme for Wireless Mobile Networks
Yixin Jiang, Chuang Lin, Xiaowen Chu and Bo Li

11:00 h Workshop 3 – 3rd International Workshop on *Performance Control in Wireless Sensor Networks*

Achieving Real-Time Operation in TinyOS
C. Duffy, J. Herbert

Electrostatic Modelling of Multiple Mobile Sinks in Wireless Sensor Networks
Z. Vincze, K. Fodor, R. Vida, A. Vidacs

A Simple and Efficient Method to Mitigate the Hot Spot Problem in Wireless Sensor Networks
H. Rivas, T. Voigt, A. Dunkles

11:00 h Workshop 4 – 2006 International Workshop *Towards the QoS Internet* – To-QoS'2006

Session 2: **Measurements and monitoring**
Session Chair: Armando Ferro

On the Statistics of QoS Parameters over Heterogeneous Networks
A.Botta, A. Pescape, and G. Ventre

QoSmeter. Generic quality of service measurement infrastructure
Rodrigo Partearroyo, Jose Luis Jodra, Jose Oscar Fajardo, Armando Ferro, and Begona Blanco

Cross-Traffic Estimation in IP Networks
Susana Sargento and Rui Valadas

MAC Layer Measurements for Supporting QoS in IEEE 802.11 Ad-Hoc Networks
Andrzej Glowacz, Marek Natkaniec, Susana Sargento, and Sergio Crisostomo

11:00 h Workshop 5 – 3rd International Workshop on *Next Generation Networking Middleware* – NGNM06

Towards an open source IMS core system enabling rapid prototyping of NGN services
D. Vingarzan, P. Weik, T. Magedanz

Dynamic service management in heterogeneous environments
using MPEG-21 DIA for multimedia content adaptation
M. Andrade, P. Souto, P. Carvalho, H. Casrto, L.Ciobanu, B. Feiten

Self-Optimizing AQM for TCP-based media streaming over Internet
H. Aoul, A. Mehaoua, C. Skianis

12:30 h Lunch

Workshops – parallel sessions

14:00 h Workshop 1 – SecPri_MobiWi 2006

Alternate Routes for Detection and Increase of Resilience to the Distributed Intrusion in WSN
Sérgio de Oliveira, Hao Chi Wong, José Marcos Nogueira and Wellington P. de Paula

Security Coordination for Interoperator Roaming Services in Cellular/PWLAN Networks
Minsoo Lee, Gwanyeon Kim, Sehyun Park and Ohyoung Song

On the Way to IEEE 802.11 DoS Resilience
Ivan Martinovic, Frank A. Zdarsky and Jens B. Schmitt

14:00 h Workshop 3 – International Workshop on *Performance Control in Wireless Sensor Networks*

An Energy and Traffic Aware Clustering (ETC) Algorithm for Wireless Sensor Networks
H. Lee, I. Oh, J. Choi

Tone-Propagated MAC (TP-MAC):
A Low Duty-cycle Low Latency MAC Protocol for Wireless Sensor Networks
A. Grilo, M. M. Macedo, M. S. Nunes

The Impact of Resync on Wireless Sensor Network Performance
M. Busse, T. Haenselmann, W. Effelsberg

14:00 h Workshop 4 – 2006 International Workshop *Towards the QoS Internet* – To-QoS'2006

Session 3: Traffic control
Session Chair: Sabine Wittevrongel

Delivering Customer Oriented Multimedia Streaming Services
David Lopez Berzosa, Francisco Gonzalez Vidal, Luis Bellido, and Alfonso Sanchez-Macian

Models to Estimate the Unicast
and Multicast Resource Demand for a Bouquet of IP-Transported TV Channels
Z. Avramova, D. De Vleeschauwer, S. Wittevrongel, H. Bruneel

User-centric Architecture for Virtual Voice-only VoIP Conferencing
R. V. Prasad, H. N. Shankar, R. S. Varchas, H. S. Jamadagni, and Przemyslaw Pawelczak

Application of Admission Control and Traffic Shaping for providing TCP Throughput Guarantees
Halina Tarasiuk, Robert Janowski, Wojciech Burakowski

14:00 h Workshop 5 – 3rd International Workshop on *Next Generation Networking Middleware* – NGNM06

IP convergence layer for B3G cellular systems
J. Rodriguez, V. Monteiro, R. Aguiar, A. Gameiro

Admission control algorithm for aggregated pipes service invocation in multi-domain IP environment
E. Borcoci, A. Asgari, G. Kormentzas, T. Ahmed, A. Mehaoua

An event based communication middleware for personalized service provision: design & evaluation
E. Koutsoloukas, S. Kapellaki, N. Tselikas, N. Dellas, J. Papanis, G. Prezerakos, I. Venieris

15:30 h Coffee Break

Workshops – parallel sessions

16:00 h Workshop 1 – **SecPri_MobiWi 2006**

Trusted Mobile Computing
Ramón Cáceres and Reiner Sailer

Copy Protection through Software Watermarking and Obfuscation
Gergely Eberhardt, Zoltán Nagy, Ernö Jeges and Zoltán Hornák

Workshop Concluding Remarks

16:00 h Workshop 3 – **International Workshop on Performance Control in Wireless Sensor Networks**

Lessons Learned from a Real Wireless Sensor Network Deployment
T. Camilo, A. Rodrigues, J. Sá Silva, F. Boavida

Workshop Concluding Remarks

16:00 h Workshop 4 – **2006 International Workshop *Towards the QoS Internet* – To-QoS'2006**

Session 4: **Protocols and architectures**
Session Chair: Martin Potts

Selected QoS Solutions for Next Generation Heterogeneous Networks
Wojciech Dziunikowski, Janusz Gozdecki, Norbert Rapacz, Michal Wagrowski

The NSIS QOS Model for Inter-domain Signaling to Enable
End-to-End QoS Provisioning Over Heterogeneous Domains
Jian Zhang and Edmundo Monteiro

DSMRouter: a DiffServ-based multicast router
Yong Jiang, Yanling Li

Closing: Wojciech Burakowski

16:00 h Workshop 5 – **3rd International Workshop on *Next Generation Networking Middleware* – NGNM06**

Workshop Concluding Remarks

Keynote Talk, May 16th, 2006

Monique Morrow, *NGN: The Journey and Beyond*

Abstract:
The keynote commences with a review of NGN in the context of the Service Provider market with a focus on service convergence. The presenter progresses from global trends to technology and architectural elements such as Virtualization, IP/MPLS, Security, OAM, IPv6,Optical, Multicast, High Availability, Quality of Service that the foundation for NGN deployment. To help service providers deliver a rich variety of services to a wide range of devices over multiple access means, the presenter defines Service Exchange Framework (SEF), which allows service providers to control customer access and use of services, without limiting the types of applications that can be deployed. The access-independent, open SEF embraces and supports today's evolving IMS standards and helps network operators achieve better visibility and control of their network.

Through enhanced network and service intelligence, the SEF gives new levels of subscriber-awareness and application-awareness that enable service providers to know who their subscribers are, where they are, how they are using their authorized services and when the policies that govern their use are applied. With IMS compliance and greater granular visibility and control, service providers can deliver new, differentiated, more securely and more profitably while benefiting from heightened insight and control over network and customer activity. The presenter will then introduce GriD and its applicability to NGN; and, conclude with a future view of the service architecture in the next 5-10 years.

CV:
Monique Morrow is currently CTO Consulting Engineer at Cisco Systems. Morrow has been working with Cisco since the early 1990s. *I knew Cisco when it had a small 'c,'* she recalls. In 1999, she was involved with the deployment of one of the first routers capable of Multi Protocol Label Switching (MPLS - see sidebar), a core technology now used by more than 300 Cisco customers, and Morrow is considered one of the world's foremost experts on the subject. She worked across several business units to determine the services, architectures, and processes that would form the Next Generation Network (NGN), now one of the company's top sales initiatives. In the past three years alone, she has published three books through Cisco Press.

Monique's collaborative spirit with customers has helped Cisco create a better market for itself, says Chip Sharp, consulting engineer manager.

Companies as diverse as British Telecom, AT&T, SBC, China Telecom, Telestra, Creative Telecom, and NCT regularly request Monique to take on an advisory role in their initiatives.

British Telecom Group Technology Officer Mick Reeve worked with Morrow on standards activities and on the formation of the IPsphere Forum and Cisco's decision to join.

Monique is technically an expert, insightful and skilled at getting agreement in difficult situations, says Reeve. *She is a tireless worker and it has been a pleasure to work with her.*

Much of Morrow's time in the near future will be spent in the Asia/Pacific theater. She recently delivered a plenary speech in Seoul, South Korea to an audience of 700 people from more than 50 countries. For the next 18 to 24 months, she will be traveling through Asia on special assignment building service provider relationships and sharing the IP-NGN vision.

Keynote Talk, May 17th, 2006

Costas Courcoubetis, Incentives for Large Peer-to-Peer Systems

Abstract:
We consider problems of provisioning an excludable public good amongst n potential members of a peer-to-peer system who are able to communicate information about their private preferences for the good. The cost of provisioning the good in quantity Q depends on Q, and may also depend on n, or on the final number of participating peers, m. Our aim is to maximize social welfare so costs are covered by payments and agents have incentives to participate and reveal their true preferences for the good.

In economics, our problem is known as the Mechanism Design problem. We need to elicit truthful information from the agents, or peers, regarding their valuation of the service, set Q, and decide which of them are allowed to participate in using the system and how much each should contribute to covering the cost of building the system at level Q. This is to be done to produce the greatest possible social welfare. While the full solution of this problem is extremely complex and not easily solved in practice, we show that as the number of agents becomes large, there is a good solution to our problem that takes a very simple form. We merely require each agent to pay the same fixed fee towards payment of the total cost, and exclude agents that are unwilling to do so. In the cases we consider, this fee need not be paid in cash, but can be paid in kind, i.e., by contributing to a fixed part of the overall service. Such a simple contribution policy is easy to implement and requires no centralized implementation. The only information required by the system designer to compute the fixed fee is the distribution of the agents' valuations for the service.

We also discuss extensions of the model where peers can choose certain parameters that may affect their behaviour and suggest some possible applications. Our first application is to a model of file sharing, in which the public good is content availability; the second concerns a problem of peering wireless LANs, in which the public good is the availability of connectivity for roaming peers. In both problems we can cope with the requirement that the payments be made in kind, rather than in cash.

CV:
Costas A Courcoubetis is heading the Network Economics and Services Group and the Theory, Economics and Systems Lab at the Athens University of Economics and Business. He was born in Athens, Greece and received his Diploma (1977) from the National Technical University of Athens, Greece, in Electrical and Mechanical Engineering, his MS (1980) and PhD (1982) from the University of California, Berkeley, in Electrical Engineering and Computer Science. From 1982 until 1990 he was Member of the Technical Staff (MTS) in the Mathematical Sciences Research Center, Bell Laboratories, Murray Hill, NJ, and from 1990 until 1999 he was Professor in the Computer Science Department at the University of Crete in Heraklion, Greece, and headed the Telecommunications and Networks Group at the Institute of Computer Science, FORTH. Since autumn 1999 he is a Professor in the Computer Science Department at the Athens University of Economics and Business.
His current research interests are economics of networks with emphasis in the development of pricing schemes that reduce congestion and enhance stability and robustness, quality of service and management of integrated services, performance and traffic analysis of large systems, applied probability models. Other interests include the combination of e-commerce technologies with telecommunications, and formal methods for software verification.
He has published over 80 papers in scientific journals such as Operations Research, Mathematics of Operations Research, Journal on Applied Probability, IEEE Transactions in Communications, IEEE Transactions in Automatic Control, IEEE JSAC, SIAM Journal on Computing, Stochastic Processes, Probability in Engineering and Information Sciences, Queuing Systems, ACM TOPLAS, JACM, Formal Methods in System Design, Telecommunications Systems, Information and Computation, Theoretical Computer Science, and in conferences such as FOCS, STOC, LICS, INFOCOM. GLOBCOM, ITC, ACM SIGMETRICS. His work has over 2400 citations according to the NECI Scientific Literature Digital Library. He is a co-author with Richard Weber of *Pricing Communication Networks: Economics, Technology and Modeling* (Wiley, 2003).

Keynote Talk, May 18th, 2006

Muriel Médard, *Network coding - where to now?*

Abstract:
Network coding has emerged as an effective way to improve the operation of networks by allowing algebraic mixing of data in the interior of networks. This technique allows for full use of available degrees of freedom and energy. Such mixing leads not only to gains in capacity with respect to traditional point-to-point routed networks, but also allows in multicast settings to have a distributed operation of the network.
These advantages of network coding render it particularly attractive for wireless settings, in which degrees of freedom are often automatically overheard by nodes which were not intended recipients.

We outline distributed operation and optimization of multicast networks in wireline and wireless settings with losses and mobility. We show that distributed optimization, akin to that found in point-to-point traditional routing, can be effectively decoupled from coding considerations and can yield significant improvements in terms of energy use in wireless networks. Moreover, even in settings where theoretical results are scant, network coding lends itself well to heuristics that can outperform traditional routing approaches. Using both theoretical results and detailed emulations of heuristic approaches, we present some examples of practical network coding for wireline multicast, wireless communications and file downloading.

We conclude with some questions about possible implications of the use of network coding for protocols, security and network design.

CV:
Muriel Médard is a Harold E. and Esther Edgerton Associate Professor in the Electrical Engineering and Computer Science at MIT and the Associate Director of the Laboratory for Information and Decision Systems. She was previously an Assistant Professor in the Electrical and Computer Engineering Department and a member of the Coordinated Science Laboratory at the University of Illinois Urbana-Champaign. From 1995 to 1998, she was a Staff Member at MIT Lincoln Laboratory in the Optical Communications and the Advanced Networking Groups. Professor Médard received B.S. degrees in EECS and in Mathematics in 1989, a B.S. degree in Humanities in 1990, a M.S. degree in EE 1991, and a Sc D. degree in EE in 1995, all from the Massachusetts Institute of Technology (MIT), Cambridge. She serves as an Associate Editor for the Optical Communications and Networking Series of the IEEE Journal on Selected Areas in Communications, as an Associate Editor in Communications for the IEEE Transactions on Information Theory and as a Guest Editor for the Joint special issue of the IEEE Transactions on Information Theory and the IEEE/ACM Transactions on Networking on Networking and Information Theory. She has served as a Guest Editor for the IEEE Journal of Lightwave Technology and as an Associate Editor for the OSA Journal of Optical Networking.

Médard's research interests are in the areas of network coding and reliable communications, particularly for optical and wireless networks. She was awarded the IEEE Leon K. Kirchmayer Prize Paper Award 2002 for her paper, *The Effect Upon Channel Capacity in Wireless Communications of Perfect and Imperfect Knowledge of the Channel*, IEEE Transactions on Information Theory, Volume 46 Issue 3, May 2000, Pages: 935-946. She was co-awarded the Best Paper Award for G. Weichenberg, V. Chan, M. Médard, *Reliable Architectures for Networks Under Stress*, Fourth International Workshop on the Design of Reliable Communication Networks (DRCN 2003), October 2003, Banff, Alberta, Canada. She received a NSF Career Award in 2001 and was co-winner 2004 Harold E. Edgerton Faculty Achievement Award, established in 1982 to honor junior faculty members *for distinction in research, teaching and service to the MIT community*. Médard is also an Associate House Master Simmons Hall.

Tutorial A

BGP – Interdomain Routing and Virtual Private Networks

Olivier Bonaventure

Description:

Today's Internet is divided in about 20000 different domains interconnected in various ways. Two types of protocols are used to route IP packets across the global Internet. Inside a single domain, the intradomain routing protocol (RIP, OSPF, ISIS, ...) builds the routing tables inside the domain so that packets follow the shortest to reach their destination inside the domain. Between domains, the Border Gateway Protocol (BGP) is used to build the interdomain routing tables while taking into account the routing policy of each domain. Designed in the early 1990s, BGP has been improved several times. Introduced in 1995 to support CIDR prefixes, BGP-4, the current interdomain routing protocol, has also been significantly modified. Other improvements to BGP are currently being discussed within IETF in parallel with the finalization of a BGP-4 specification aligned with today's implementations. Besides its utilization in the global Internet, BGP is becoming more and more important for service providers due to its role in Virtual Private Network (VPN) services.

This one day tutorial is targeted at both researchers and network engineers having already a good knowledge of the IP protocol suite but who needs to better understand BGP-4. The course assumes a basic knowledge of IP and intradomain routing protocols, but no prior knowledge of BGP4.

BGP is the glue to allow packets to be forwarded through multiple Autonomous Systems (Ases) in the Internet. The growth of the Internet and of the VPN services is causing some problems to BGP and some researchers are considering the development of alternatives to BGP. However, to build those alternate protocols, a good understanding of the current usages of BGP is necessary.

Outline of the tutorial:

Part 1: Organization of the global Internet. A quick overview of the meaning of AS, the roles of intradomain routing and interdomain routing and the interconnections between ASes.

Part 2: BGP Basics. A step by step description of the BGP protocol starting from the basics. We try to explain both how the mechanisms behave and why they have been designed like this.

Part 3: BGP in large networks. This part goes deeper in the BGP protocol and explains the role of iBGP, the need of route reflectors and confederations, BGP decision process.

Part 4: BGP-based Virtual Private Networks. In this part, we explain the utilization of BGP to build BGP/MPLS VPNs. This usage of BGP is very important in ISP networks as large ISPs are now using VPNs as a basic mechanism to segment their network to support different types of services.

Part 5: Research challenges. In this part, we survey the recent literature on BGP and discuss several of the challenges in interdomain routing such as scalability, fast convergence, traffic engineering and security.

Short Biography of the Presenter:

Olivier Bonaventure graduated from the University of Liège as engineer in computer science in 1992 and obtained a Ph.D. for his work on the performance of TCP over ATM networks. He worked during one year as a researcher at Alcatel in Antwerp. He was professor at the University of Namur, Belgium where he lead the networking research group composed of five researchers. He received the Wernaers prize for his development of online networking courses and the Alcatel prize awarded by the Belgian National Fund for Scientific Research (FNRS) in 2001. He now leads the network research group at Université Catholique de Louvain (UCL), Belgium and is the leader of the TOTEM project that builds an open-source traffic engineering toolbox (http://totem.info.ucl.ac.be). He has published more than thirty papers, was granted four patents while working for industry. He is on the editorial board of IEEE Network Magazine, was guest editor of the special issue on interdomain routing and is on the editorial board of IEEE/ACM Transactions on Networking. His current research interest includes intra- and interdomain routing, traffic engineering, multicast and network security.

Recent papers and presentations may be found on: http://www.info.ucl.ac.be/people/OBO

Tutorial B

IP-Oriented QoS in the Next Generation Networks: Application to Wireless Networks

Pascal Lorenz

Description:

Emerging Internet Quality of Service (QoS) mechanisms are expected to enable wide spread use of real time services such as VoIP and videoconferencing. The *best effort* Internet delivery cannot be used for the new multimedia applications. New technologies and new standards are necessary to offer Quality of Service (QoS) for these multimedia applications. Therefore new communication architectures integrate mechanisms allowing guaranteed QoS services as well as high rate communications. The service level agreement with a mobile Internet user is hard to satisfy, since there may not be enough resources available in some parts of the network the mobile user is moving into. The emerging Internet QoS architectures, differentiated services and integrated services, do not consider user mobility. QoS mechanisms enforce a differentiated sharing of bandwidth among services and users.

Thus, there must be mechanisms available to identify traffic flows with different QoS parameters, and to make it possible to charge the users based on requested quality. The integration of fixed and mobile wireless access into IP networks presents a cost effective and efficient way to provide seamless end-toend connectivity and ubiquitous access in a market where the demand for mobile Internet services has grown rapidly and predicted to generate billions of dollars in revenue.

This tutorial covers the issues of QoS provisioning in heterogeneous networks and Internet access over future wireless networks as well as ATM, MPLS, DiffServ, IntServ frameworks. It discusses the characteristics of the Internet, mobility and QoS provisioning in wireless and mobile IP networks. This tutorial also covers routing, security, baseline architecture of the inter-networking protocols and end to end traffic management issues.

Short Biography of the Presenter:

Pascal Lorenz (lorenz@ieee.org) received a PhD degree from the University of Nancy, France. Between 1990 and 1995 he was a research engineer at WorldFIP Europe and at Alcatel-Alsthom. He is a professor at the University of Haute-Alsace and responsible of the Network and Telecommunication Research Group. His research interests include QoS, wireless networks and high-speed networks. He was the Program and Organizing Chair of the IEEE ICATM'98, ICATM'99, ECUMN'00, ICN'01, ECUMN'02 and ICT'03, ICN'04, PWC'05 conferences and co-program chair of ICC'04. Since 2000, he is a Technical Editor of the IEEE Communications Magazine Editorial Board. He is the vice-chair of the IEEE ComSoc Communications Software Technical Committee and secretary of the IEEE ComSoc Communications Systems Integration and Modelling Technical Committee. He is senior member of the IEEE, member of many international program committees and he has served as a guest editor for a number of journals including Telecommunications Systems, IEEE Communications Magazine and LNCS. He has organized and chaired several technical sessions and gave tutorials at major international conferences. He is the author of 3 books and 160 international publications in journals and conferences.

Tutorial C

Extensible IP Signaling: Architecture, Protocols and Practice

Xiaoming Fu and **Hannes Tschofenig**

Description:

In the last few years, a number of applications have emerged that can benefit from network-layer signaling, i.e., the installation, maintenance and removal of control state in network elements. These applications include path-coupled and path-decoupled quality of service (QoS) management and resource allocation, as well as network diagnostics, NAT and firewall control. These applications call for an extensible and securable signaling protocol. This tutorial will elaborate the recent standardization efforts in the IETF for a new extensible IP signaling protocol suite developed by its Next Steps in Signaling (NSIS) working group. In particular, we present the architecture, protocol design and our development experiences of the NSIS protocol suite, and compare them with RSVP, the current Internet QoS signaling protocol.

Table of Content:

Motivation and tutorial overview
A review of existing Internet signaling protocols
NSIS: an extensible IP signaling architecture
GIST: General Internet Signaling Transport protocol
QoS signaling application protocol in NSIS
NAT/firewall signaling application protocol in NSIS
Security considerations in NSIS
A comparison between NSIS and RSVP
Implementation experiences and deployment perspectives
Open issues and related work

Short Biography of the Presenters:

Xiaoming Fu received a Ph.D. degree in Computer Science from Tsinghua University, China, in 2000. He was research staff at Technical University Berlin before joining the University of Goettingen as an assistant professor in 2002. His research interests encompass network architectures, mobile networks, protocol design, validation, and performance evaluation. He is leading a research team comprising 1 postdoc, 7 Ph.D. candidates and several master students at Goettingen which is involved in several EU projects (including ENABLE, Daidalos II and VIDIOS) and other international and national research collaboration projects. He is a co-author of RFC 4094, more than 40 peer-reviewed papers and a book to be published by Jon Wiley & Sons Inc. He has served on the Technical Committees of IEEE ICDCS'06, GLOBECOM'06, ICC'06, AINA'04-'06, and the IEEE Computer Communications Workshop 2003, as well as session chair for IFIP Personal Wireless Conference 2005. He is an Expert of ETSI STFs for IPv6 Interoperability. He was a visiting scientist at the Computer Laboratory, University of Cambridge in September 2005.

Hannes Tschofenig received a Diploma degree in Computer Science from the University of Klagenfurt, Austria, in 2001. He joined Siemens Corporate Technology in the same year where he is currently a research scientist. His research focuses on security issues especially with mobile communications. He is active in IETF, e.g., the GEOPRIV, MOBIKE, PANA, EAP, TLS, RADEXT, AAA and MIP6 working groups. In addition, he serves as chair of the Emergency Context Resolution with Internet Technologies (ECRIT) working group and Secretary of the NSIS working group. He is a co-author of RFCs 3726, 4081, 4230 and 4279, a number of Internet drafts, and a forthcoming book. He has been a guest lecturer in several German universities, including University of Goettingen, Berufsakademie Stuttgart and Technical University Munich. He also participates in EU sponsored research projects, such as Ambient Networks and ENABLE.

Tutorial D

Roadmap to Cross-Layer and Cross-System Optimization for B3G

George Kormentzas and Charalabos Skianis

Description:

The beyond 3G vision constitutes in a diverse wireless networking world of *network-of-wirelessnetworks* accommodating a variety of radio technologies and mobile service requirements in a seamless manner. The achievement of this vision raises significant research challenges in view of system coexistence; system scale; network robustness requirements; and evaluation tools design and modeling. The key objectives of this tutorial are in part motivated by the importance of cross-layer interactions, in order to efficiently use the radio resource space in wireless networks, and in part by the vision of the integration of heterogeneous wireless technologies providing new wideband services running over flexible QoS-enabled IP based access and core networks. This tutorial brings into the foreground a broad range of research results on cross-system and cross-layer optimization algorithms taking into account issues related to usage behavior, mobility patterns, traffic profiling, QoS issues, security, network selection and relevant horizontal/vertical handovers. Specifically, the tutorial will firstly address the importance of cross-layer interactions, in order to efficiently use the radio resources in wireless networks. Afterwards, heterogeneous platform management algorithms will be presented and advanced resource management policies, including the potential for load balancing across different systems/networks, will be discussed. Subsequently, studies concerning both cross-layer and crosssystem optimization in B3G environment will be presented. Finally, specific solutions/cases deployed in the context of various EU-funded projects will be analyzed in accordance with current efforts of various forums such as 3GPP, IEEE, IETF, ETSI and WWRF.

Short Biography of the Presenters:

George Kormentzas is currently lecturer in the University of the Aegean, Department of Information and Communication Systems Engineering. He was born in Athens, Greece on 1973. He received the Diploma in Electrical and Computer Engineering and the Ph.D. in Computer Science both from the National Technical University of Athens (NTUA), Greece, in 1995 and 2000, respectively. From 2000 to 2002, he was a research associate with the Institute of Informatics & Telecommunications of the Greek National Centre for Scientific Research *Demokritos*. His research interests are in the fields of traffic analysis, network control, resource management and quality of service in broadband heterogeneous wired/wireless networks. He has published extensively in the fields above, in international scientific journals, edited books and conference proceedings. He is a member of pronounced professional societies, an active reviewer and guest editor for several journals and conferences and EU-evaluator for Marie Curie Actions. George Kormentzas has participated in a number of national and international research projects, serving in some instances as the project's technical representative for University of Aegean and/or as WP leader and/or as the project's Technical Manager. Specifically, he acted as Guest Editor for Computer Communications journal (Elsevier Science) on *Emerging Middleware for Next Generation Networks* (Special Issue to appear). Currently, he is chairing the 3rd International Workshop on Next Generation Networking Middleware (NGNM06) at the forthcoming Networking 2006. He also chaired NGNM04 and NGNM05 in the context of IFIP Networking 2004 and Networking 2005 respectively, and he was Technical Program co-chair of 5th International Network Conference (INC2005). Currently, he is Technical Manager of IST-2005-FP6 UNITE STREP project: *Virtual Distributed Testbed for Optimization and Coexistence of Heterogeneous Systems*.

Dr. Charalabos Skianis is currently a Researcher with the Institute of Informatics and Telecommunications at the National Centre for Scientific Research *Demokritos*, in Greece and a visiting Lecturer in the Department of Information and Communication Systems at the University of the Aegean in Samos, Greece. He holds a PhD degree in Computer Science, University of Bradford, United Kingdom and a BSc in Physics, Department of Physics, University of Patras, Greece. He has been actively working on the area of computer and communication systems performance modeling and evaluation where he has introduced alternative methodologies for the approximate analysis of certain arbitrary queuing network models. He is also keen in traffic modeling and characterization, queuing theory and traffic control of wired and wireless telecommunication systems.

Tutorial E
Peer-to-Peer Networking
Raouf Boutaba

Description:
The past few years have witnessed the emergence of Peer-to-Peer (P2P) systems as a means to further facilitate the formation of communities of interest over the Internet in all areas of human life including technical/research, cultural, political, social, entertainment, etc. P2P technologies involve data storage, discovery and retrieval, overlay networks and application-level routing, security and reputation, measurements and management.
This tutorial will give an appreciation of the issues and state of the art in Peer-to-Peer Networking. It will introduce the underlying concepts, present existing architectures, highlight the design requirements, discuss the research issues, compare existing approaches, and illustrate the concepts through case studies. The ultimate objective is to provide the tutorial attendees with an in-depth understanding of the issues inherent to the design, deployment and operation of large-scale P2P systems.

Short Biography of the Presenter:
Dr. Raouf Boutaba is an Associate Professor in the School of Computer Science of the University of Waterloo. Before that he was with the Department of Electrical and Computer Engineering of the University of Toronto. Before joining academia, he founded and was the director of the telecommunications and distributed systems division of the Computer Science Research Institute of Montreal (CRIM).
Dr. Boutaba conducts research in the areas of network and distributed systems management and resource management in multimedia wired and wireless networks. He has published more than 200 papers in refereed journals and conference proceedings. He is the recipient of the Premier's Research Excellence Award, two NORTEL research excellence Award and several Best Paper awards. He is a fellow of the faculty of mathematics of the University of Waterloo and a distinguished lecturer of the IEEE Communications Society. Dr. Boutaba is the Chairman of the IFIP Working Group on Networks and Distributed Systems, the Chair of the IEEE Communications Society Technical Committee on Information Infrastructure and the IEEE Communications Society Technical Sub-Committee on Autonomic Communications, and the Director of the Related Societies Board of IEEE Communications Society. During the past years, Dr. Boutaba served as the Director of standards board of the IEEE Communications Society, the Vice Chair of IEEE Communications Society Technical Committee on Information Infrastructure, and a distinguished lecturer of the IEEE Computer Society. He is the founder and acting editor in Chief of the IEEE Transactions on Network and Service Management published online, on the advisory editorial board of the Journal of Network and Systems Management, on the editorial board of the KIKS/IEEE Journal of Communications and Networks, and the editorial board of the Journal of Computer Networks. He acted as the program chair for the IFIP Networking conference and the IEEE CCNC conference, and a general or program co-chair for the IEEE/IFIP NOMS, IFIP/IEEE MMNS, IEEE FIW, IEEE ACC and IEEE ICC symposia. Dr. Boutaba teaches computer networks and distributed systems and conducts research in the area of resource management in wired and wireless networks.

Tutorial F

User directed and QoS driven routing: theoretical and experimental considerations

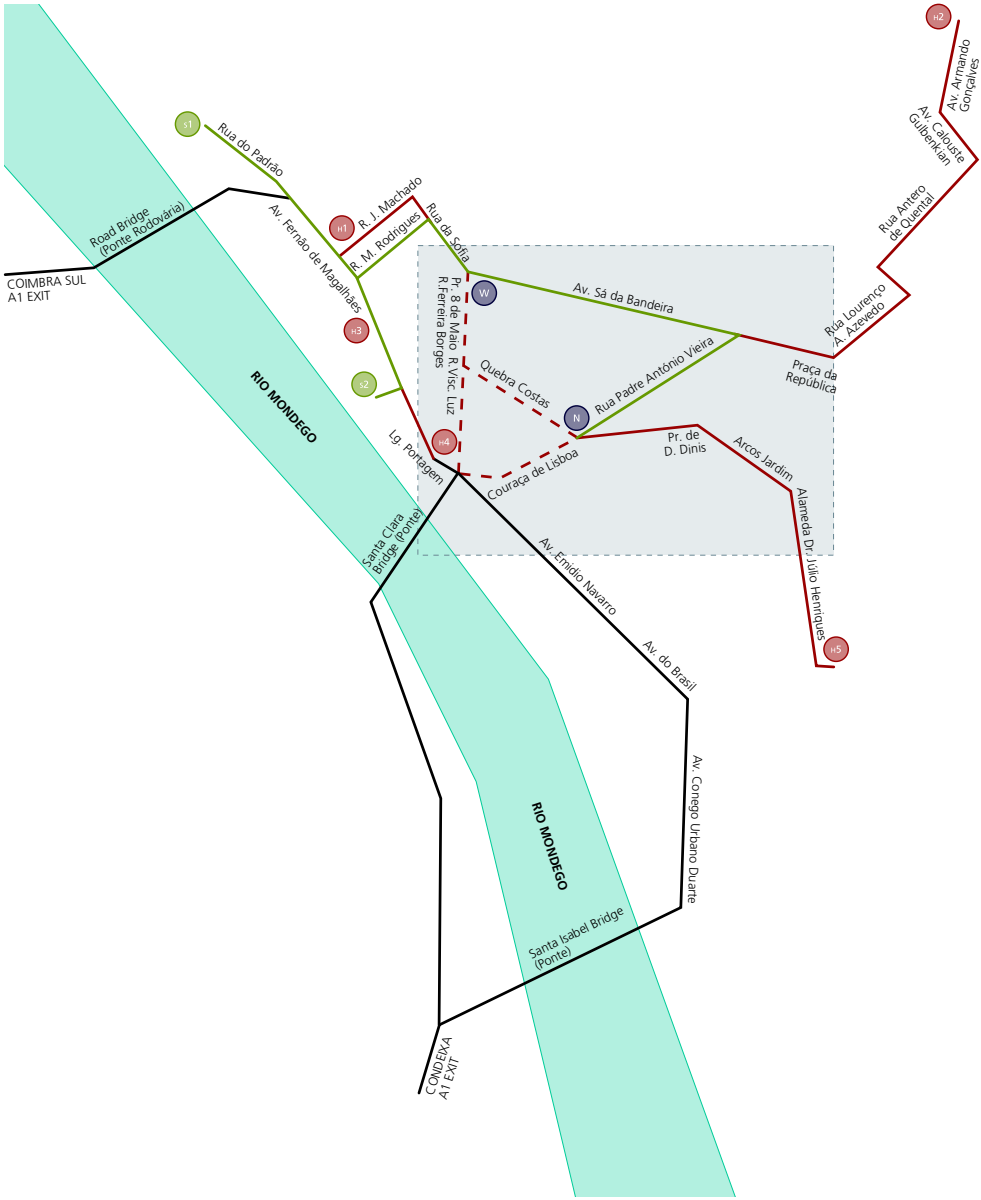
Erol Gelenbe

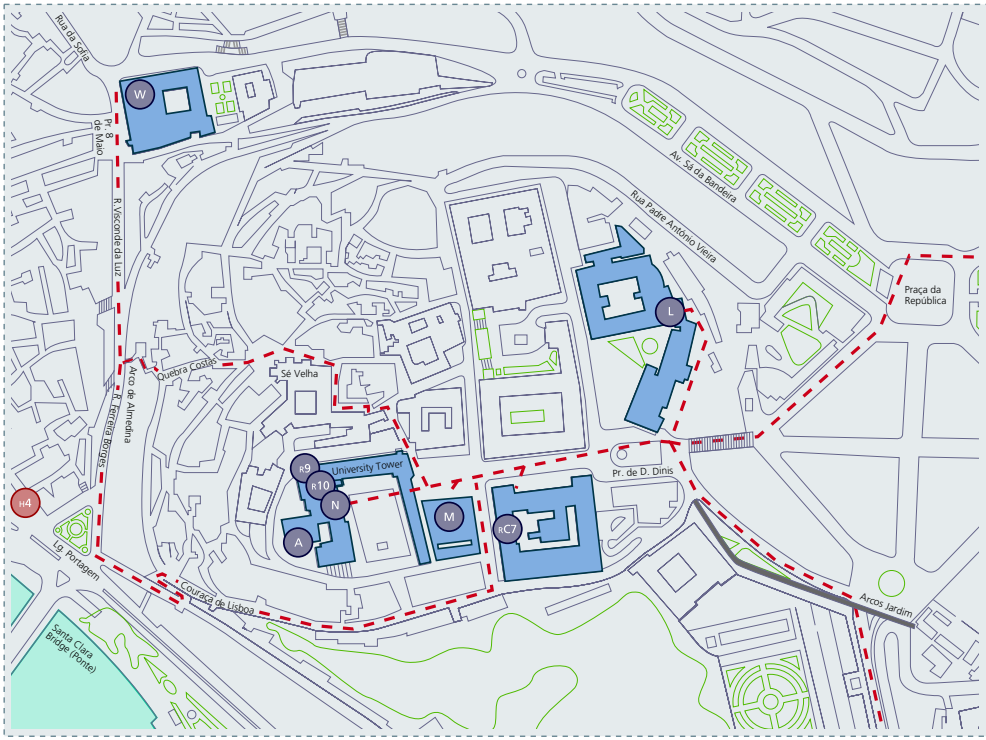
Description:

One of the tendencies in network research is to consider opportunities to improve network performance and/or user perceived QoS through adaptability. Building adaptability in networks requires a choice of protocols, algorithms, and tools or methods both for system design and implementation. Furthermore, the need to deal with legacy aspects of networks requires that adaptability should preferably preserve compatible interfaces with the IP protocol. Our tutorial will address all of these points in the framework of QoS driven routing where the users and routers share in the decision making process. We will describe a set of *provably sensible* algorithms based on route discovery that optimise QoS, and show how they translate into a network routing protocol. We will describe the protocol's implementation using neural networks and other techniques.
We will report on both theoretical and experimental results on a test-bed that implements these techniques.

Short Biography of the Presenter:

Erol Gelenbe (PhD DSc) is Professor in Computer and Communication Networks at Imperial College where he holds the Dennis Gabor Chair. He is a Fellow of IEEE, ACM and IEE and a Member of Academia Europaea. One of the founders of the field of computer and network performance evaluation, his work over the last decade has included video compression, packet and ATM network QoS and admission control, product form queuing networks, and neural computation, for which he has been awarded three US patents and published articles in the IEEE J. on Selected Areas in Communications, IEEE Communications, Performance Evaluation, IEEE Trans. on Neural Networks, Proceedings of the IEEE and other journals. He has graduated over 50 PhDs and has been himself awarded honorary doctorates by the University of Rome Tor Vergata, Bogazici University in Istanbul, and the University of Liege (Belgium).


S1
Rua do Padrão
Road Bridge
(Ponte Rodoviária)
COIMBRA SUL
A1 EXIT
Av. Fernão de Magalhães
R. J. Machado
R. M. Rodrigues
Rua da Sofia
H1
H3
S2
W
Pr. 8 de Maio
R.Ferreira Borges
R. Visc. Luz
Av. Sá da Bandeira
Quebra Costas
N
Rua Padre António Vieira
H4
Couraça de Lisboa
Lg. Portagem
RIO MONDEGO
Santa Clara
Bridge (Ponte)
Av. Ernido Navarro
Av. do Brasil
Av. Conego Urbano Duarte
RIO MONDEGO
Santa Isabel Bridge
(Ponte)
COIMBRA
A1 EXIT
Praça da
República
Rua Lourenço
A. Azevedo
Rua Antero
de Quental
Av. Calouste
Gulbenkian
Av. Armando
Gonçalves
H2
Pr. de
D. Dinis
Arcos Jardim
Alameda Dr. Júlio Henriques
H5



- S1 — *Coimbra B* Train Station (main station)
- S2 — *Coimbra A* Train Station (downtown station)
- H1 — Hotel Tivoli
- H2 — Hotel Melia Tryp
- H3 — Hotel Almedina
- H4 — Hotel Astoria
- H5 — Residencial Botânico
- W — Welcome Reception (*Câmara Municipal* – City Hall)
- N — Networking 2006 Conference Venue (*Faculdade de Direito, Universidade Velha*)
- R9 — Room 9 (Parallel Sessions)
- R10 — Room 10 (Parallel Sessions)
- A — Conference Auditorium & Registration Desk
- RC7 — Room C7 (Workshop)
- L — Lunch Restaurant (*D.Dinis*)
- M — E-Next and CONTENT Meeting Rooms (*Biblioteca Geral*)
- Walking Paths

Useful Contacts

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Rua João Machado
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Hotel Astoria Coimbra
Av. Emídio Navarro, n.º 21
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Residencial Botânico
Bairro de São José, n.º 15
Tel.: (+351) 239 714 824

Politaxis (Coimbra Taxi service)
Tel. (+351) 239 499 090

Beta-Viagens (Travel Agency)
Tel.: (+351) 239 793 000

Conference Logistics

Room Assignments
Plenary Sessions
Conference Auditorium (Faculdade de Direito)
Parallel Technical Sessions
Auditorium, Room 9, Room 10
Poster Sessions
Auditorium, Lounge
Tutorials
Auditorium, Auditorium Terrace, Room 9, Room 10
Workshops
Auditorium, Room 9, Room 10, Room C7
E-Next and **Content Meetings**
Biblioteca Geral (Main Library Building)
IFIP Meeting
Dep. Eng. Informática, Polo II (transportation will be provided)

Coffee Breaks
Coffee breaks will be served in the Auditorium Bar.

Lunches
Lunches will be served at Centro Cultural D. Dinis, 200 meters from the Conference Auditorium. Please refer to the map of the Conference Venue to locate the Restaurant.

Wireless Internet
SSID: guest-e-U (web-based authentication)
Username/Password: networking@uc / networking
Available services: HTTP, HTTPS, POP3S, IMAPS, SMTP

Wired Internet
A very limited number of PCs will be available in the Auditorium Terrace.

Taxis
Taxis are sometimes available right in front of *Porta Ferrea*. You may also ask the local organization to call a Taxi for you or phone the local Taxi Service (239 499 090).

Social Program

Welcome Reception – Tuesday Evening
The Welcome Reception will be held in the City Hall (Câmara Municipal), downtown. The short walk from the Conference venue to the City Hall, signaled in the provided map, will give you the opportunity to appreciate Sé Velha, Arco de Almedina and some of the oldest streets of Coimbra. If you prefer to take a taxi, ask the driver to take you to Câmara Municipal.

Conference Banquet – Wednesday Evening
The Conference Banquet will be held at Casino Figueira, located in the center of Figueira da Foz, a small town in the Atlantic Coast, 40 km west of Coimbra. After the banquet you may watch the Casino Show (Desire) or try your luck in the Game Rooms.
Bus transportation to/from the banquet will be provided by the organization. If you prefer to drive, take highway A14 from Coimbra to Figueira da Foz and then follow local directions to the Casino.